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ABSTRACT

This program is designed to provide entry-level training to individuals (especially workers displaced from industry) who desire employment as "slot technicians" in the casino industry. The 96-hour course includes both classroom instruction and hands-on experience. Sources for direct purchase of required manuals are provided. The 13 modules consist of a cover sheet with title, job skill to be developed, objective, and list of required materials; a pretest/posttest; sheets with information and activities; and pretest/posttest answers. Module topics are illegal gaming activities, assembly location and purpose, troubleshoot to sub-assembly level, terms and symbols, electronic components, disassembly and reassembly of major sub-assemblies, operational tests, printed circuit boards, soldering techniques, use of a digital multimeter, use of commercial testing equipment, and preventive maintenance. Appendixes include "slot tech" duties, three trouble flowcharts, a preventive maintenance schedule, and a sample competency certificate. (YLB)

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A COMPETENCY-BASED PROGRAM FOR
ELECTRONIC GAMING EQUIPMENT REPAIR

by

James R. Hardman

The Arizona Center for Vocational Education

Northern Arizona University

Flagstaff, Arizona 86011

August 1984

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FOREWORD

The Electronic Gaming Equipment Repair program was funded in October of 1983 to provide entry-level training to workers displaced from industry who desired employment as "Slot Technicians" in the casino industry.

Mohave Community College, local casinos, and electronic gaming equipment manufacturers teamed together to provide the equipment, instructors and instructional materials needed for the eighty-hour program. Approximately \$20,000 in slot machines and testing equipment was loaned to the college by International Game Technology and Bally Distributing of Nevada, Inc. Participant recruitment was provided by the Department of Economic Security, Job Service; and vocational screening was done by Mohave Educational Services.

The success of this program, which was pilot-tested in the Spring of 1984, has resulted in its becoming part of the official course bank of Mohave Community College. It will be offered regularly on a demand basis as employment opportunities grow.

ACKNOWLEDGEMENTS

The following persons and organizations are recognized as having made significant contributions to the success of this project and the development of the curriculum:

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INTRODUCTION

The Electronic Gaming Equipment Repair course was pilot-tested during the Spring semester of 1984 at Mohave Community College, Mohave Valley Campus, Arizona. Two classes were offered, an evening class for unemployed persons seeking first-time employment in the casino industry, and a daytime class for casino employees wishing to upgrade their skills for promotion to a better job. As of July 1984, approximately 80% of the unemployed group had obtained jobs in the industry. Of the employed group, about 50% have been promoted within the local (Laughlin, Nevada) casinos or offered better jobs from Las Vegas casinos.

The original eighty-hour course included both classroom instruction and hands-on experience. The course has been expanded to ninety-six hours to allow more hands-on practice. Classes met three hours a day, twice a week, for thirteen weeks. Approximately three-fourths of the course was conducted at the college, while the remainder took place in a special room provided by the Riverside Casino where a greater number of gaming machines were available for more hands-on activities.

The following manuals are an integral part of the course and should be purchased directly from the suppliers:

INTERNATIONAL GAME TECHNOLOGY
Attn: Document Control
520 South Rock Blvd.
Reno, NV 89502

1. IGT Fortune II Series Service & Parts Manual
2. IGT 701/705 Draw Poker Service & Parts Manual
3. IGT 8051 Tester Service & Parts Manual

BALLY MANUFACTURING CORPORATION
2609 South Highland
Las Vegas, NV 89109

1. Bally "E" Series Operator Instructions Manual,
Manual FO-650-12
2. Bally "E" Series Parts Catalog, Manual #7080
3. Bally "E" Series PCB Schematics/Parts Lists for all
Electronic Slot Machines, Manual FO-650-13
4. Bally "E" Series MPU Board Test Station
Operator Guide and Test Procedures, Manual FO-650-3
5. Bally "E" Series Peripheral Test Station
Operator Guide and Test Procedures, Manual FO-650-2, Issue 2
6. Bally "E" Series Schematic Diagram, W-1046-2592,
or equivalent

Describe Illegal
Gaming Activities

Direct Instruction and Self-Taught Instruction

Job Skill:

Describe illegal electronic gaming activities.

Objective:

Correctly identify illegal electronic gaming activities.

Materials Needed:

1. Bally "E" Series Slot Machine
2. IGT Fortune II Video Slot Machine
3. IGT 705 Video Poker Machine
4. Slugs (Illegal Currency)

Pretest:

Directions: Circle the correct answer.

1. One purpose of security is to protect customers from slot cheats. T F
2. Rhythm Method is a "system based on a religious belief." T F
3. Six-sided dice can be made to land with predictable results. T F
4. In today's Las Vegas, the most dishonest person in any casino is the customer. T F
5. The majority of "systems" are based on the Laws of Probability and are illegal. T F
6. Galileo's calculations are exactly the same as those used today to calculate percentages and are therefore being disseminated legally to the general public. T F
7. One method of preventing illegal gaming activity is to provide "door open" indicators. T F
8. Slot machines can be wired to "tilt" with the the door open. T F
9. Bookkeeping meters are active when the doors are open or closed. T F
10. On Bally "E" Series slot machines the "door open" indicator is a ringing bell. T F
11. All manufacturers use methods to protect their computer programs. T F
12. It is possible to electronically cheat a slot machine. T F
13. Draw a line connecting the correct answers:

a. Buzzer	1. Dice
b. Odds	2. Work Card
c. 22 Stops	3. Probability
d. Shaving	4. Slot Machine Term
e. State Gaming Requirement	5. Security Device

Information:

In general, when most people hear the expression "illegal gaming," the first thoughts are of the common variety, i.e., gaming in states where it is expressly prohibited by law or unlicensed activities such as bookmaking. These illegal activities, however, are not the objectives of this job skill. Instead, the student should recognize that with the advances made in technology - especially high tech microprocessor chips - a new illegal aspect has come into the limelight: namely, the manipulation of the game and payoffs by electronic means. In other words, the customer can cheat electronically or through the use of slugs (illegal currency.)

Activity #1:

Using one of the gaming machines provided:

1. Observe game conditions under normal circumstances.
2. Insert coin (legal) and observe machine responses.
3. Play games and observe.
4. Open door and observe machine indicators.
5. Close door and insert slugs (provided by your instructor).
6. Observe machine responses.

Information:

Sophisticated electronic gaming cheats, when given access to the microprocessor and program integrated circuits, can directly affect the outcome of the game. Manufacturers are taking preventive measures to offset this danger.

Activity #2:

Using the following equipment, in your own words indicate the game manufacturer's methods of detecting and auditing game cheaters:

1. IGT 705 VIDEO POKER MACHINE

Coin Acceptor: _____

Door Open: _____

Program Protection: _____

2. BALLY "E" SERIES SLOT MACHINE

Coin Acceptor: _____

Activity #2: (continued)

Door Open: _____
_____Program Protection: _____

3. IGT FORTUNE II MACHINE

Coin Acceptor: _____
_____Door Open: _____
_____Program Protection: _____

Posttest:

Same as Pretest

KEY

Pretest / Posttest:

- | | |
|------|-------|
| 1. T | 7. T |
| 2. F | 8. T |
| 3. T | 9. F |
| 4. T | 10. F |
| 5. F | 11. T |
| 6. T | 12. T |

13. Draw a line connecting the correct answers:
- a. 5
 - b. 3
 - c. 4
 - d. 1
 - e. 2

Activity #2:

IGT 705 VIDEO POKER MACHINE

- Coin Acceptor - Magnetic detection of non-USA coins, width detection, weight detection, anti-string devices.
- Door Open - Tower light.
- Program Protection - Separate key to unlock security door covering microprocessor board.

BALLY "E" SERIES SLOT MACHINE

- Coin Acceptor - Same as 705.
- Door Open - Tower light, door buzzers, tilt condition after playing.
- Program Protection - Not necessary if other security devices are in place and machine functions properly when tampering occurs.

IGT FORTUNE II MACHINE

- Coin Acceptor - Same as 705.
- Door Open - Tower lift, closure information on screen.
- Program Protection - Separate key to unlock security door covering microprocessor board.

Identify Assembly
Location and Purpose

Direct Instruction and Self-Taught Instruction

Job Skill:

Identify the location and purpose of the major assemblies and sub-assemblies of the various video poker/slot machines.

Objective:

Correctly identify and describe the function of the major assemblies and sub-assemblies of the Bally "E" Series, IGT Fortune II, and IGT 705 Video Poker/Slot Machines.

Materials Needed:

1. Bally "E" Series Slot Machines
2. IGT Fortune II Video Slot Machines
3. IGT 705 Video Poker Machines
4. Bally "E" Series Parts Manual #7080
5. IGT Fortune II Service & Parts Manual
6. IGT 705 Service & Parts Manual
7. Wrenches
8. Phillips Screwdriver
9. Common Screwdriver

Pretest:

Directions: Using Manual #7080, identify the following parts:

1. Page 2 - Cabinet Assembly

ITEM #	DESCRIPTION
a _____	Door Hinge Switch
b _____	Switch Actuating Bracket
c _____	Bell Assembly
d _____	Handle Mechanism Assembly
e _____	Handle Assembly
f _____	I/O Board Assembly
g _____	MPU Board Assembly

2. Page 6 - Front Door Assembly - Front View

a _____	Service Switch
b _____	Reel Glass
c _____	Coin Drop Casting
d _____	Fluorescent Lamp (General Illumination)
e _____	Payout Tray (Coin Tray)

3. Page 4 - Cabinet Assembly

a _____	Top Glass
b _____	Convenience Outlet
c _____	Fuse Mounting Bracket
d _____	On/Off Switch
e _____	Power Supply Board
f _____	Insert & Lamp Socket Assembly
g _____	Transformer
h _____	Jackpot/Meter Lock
i _____	Jackpot/Meter Switch

Pretest: (continued)

4. Page 8 - Front Door Assembly - Rear View

ITEM #	DESCRIPTION
a_____	Coin Diverter Ramp
b_____	Electric Door Lock (Security)
c_____	Door Lock
d_____	Door Open Switch
e_____	Coin Accept Lamp
f_____	Meter Display Board
g_____	Slug Rejector (Coin Acceptor)
h_____	Coin Switch and Wire Assembly
i_____	Coin Lockout Relay
j_____	Lock Slide Assembly

Information:

Most electronic gaming devices have many assemblies that have the same nomenclature and can therefore be identified by generic name. Some of these are: Coin acceptors, coin chute, coin return buttons, feature glass, belly glass, reel glass, general illumination and lamps. The student will find that knowledge of one machine results in knowledge of another.

Activity #1

Using the appropriate manuals and the three electronic gaming machines:

1. Locate all external glass.
2. Locate coin acceptors.
3. Remove coin acceptors.
4. Locate hopper units.
5. Remove hopper units.
6. Reinstall hopper and coin acceptor.
7. Depress door hinge switch.
8. Depress coin-in switch.
9. Depress service switch.
10. Turn power on.
11. Locate fluorescent lamps and starters.
12. Locate fuse holder or circuit breakers.

Activity #2:

Using the appropriate manuals, make a list of the various printed circuit boards (PCB's) found in the slot machines:

Bally "E" Series:

PCB NAME	QUANTITY
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Fortune II:

PCB NAME	QUANTITY
_____	_____
_____	_____
_____	_____

Activity #2: (continued)

705 Poker:

PCB NAME	QUANTITY
_____	_____
_____	_____
_____	_____
_____	_____

Posttest:

Same as Pretest

KEY

Pretest / Posttest:

1. Page 2 - Cabinet Assembly

a. 5	e. 19
b. 7	f. 14
c. 40	g. 15
d. 21	
2. Page 6 - Front Door Assembly - Front View

a. 5	d. 23
b. 31	e. 18
c. 34	
3. Page 4 - Cabinet Assembly

a. 38	f. 35
b. 18	g. 29
c. 30	h. 13
d. 26	i. 15
e. 23	
4. Page 8 - Front Door Assembly - Rear View

a. 42	f. 18
b. 59	g. 57
c. 7	h. 54
d. 8	i. 48
e. 30	j. 5

Activity #2:

Bally "E" Series:

Power Supply Board	1
Hopper Control Board	1
Reel Reader Control Board	1
Reel Reader Board	3 - 5
Microprocessor Board	1
I/O Board	1
Sound Board Assembly	1
Progressive Board	1 (When Applicable)

Fortune II:

Microprocessor Board	1
Sound Board	1
Interface Board	1

705 Poker:

Microprocessor Board	1
Interface Board	1
Sound Board	1
Mother Board	1

Troubleshoot to
Sub-Assembly Level

Direct Instruction and Self-Taught Instruction

Job Skill:

Troubleshoot to the sub-assembly level the various video poker/
slot machines.

Objective:

Correctly use common sense, logical evaluation and appropriate
documents to troubleshoot to the sub-assembly level the Bally
"E" Series, IGT Fortune II, and IGT 705 Video Poker/Slot Machines.

Materials Needed:

1. Bally "E" Series Slot Machine
2. IGT Fortune II Video Slot Machine
3. IGT 705 Video Poker/Slot Machine
4. Bally "E" Series Trouble Flowcharts (See Appendix B, C, D)
5. IGT Fortune II Service & Parts Manual
6. IGT 705 Service & Parts Manual
7. Bally Operator Instruction Manual #FO-650-12

Pretest:

Directions: Circle the correct answer.

- | | | |
|--|---|---|
| 1. One cause of a machine refusing to accept coins can be due to the player not knowing how to play the game. | T | F |
| 2. Failure of a Bally "E" Series machine to produce bookkeeping meters can be traced to a "door open" condition. | T | F |
| 3. All machine problems can be repaired by a system known as "shotgunning." | T | F |
| 4. Sometimes knowing symptoms is more valuable than knowing how a machine works electronically. | T | F |
| 5. A machine malfunction always results in a "tilt" condition. | T | F |
| 6. A Bally "E" Series can be tested for correct operation without inserting coins. | T | F |
| 7. An IGT Fortune II must be troubleshot using the "shotgun" method. | T | F |
| 8. An IGT 705 must be troubleshot using "random guess" methods. | T | F |
| 9. All electronic slot machine games have built in test features. | T | F |
| 10. "Random guess" and "shotgun" methods are only used as a last resort when troubleshooting. | T | F |
| 11. Machine "black out" conditions are always caused by power failures. | T | F |
| 12. A code 41 on a Bally slot machine generally indicates a failure of the first reel. | T | F |

Information:

Facing severe technical manpower short-falls beginning around 1970, and recognizing that this short-fall is accelerating as electronic industries head toward the years 1990 and beyond; manufacturers of sophisticated electronic equipment have begun incorporating built-in test features and logical troubleshooting devices to enable service personnel to maintain their devices without a high level of electronic education.

This fact is certainly evident in electronic gaming where Slot Mechanics with no electronic training have been maintaining electronic gaming equipment without the benefit of formal training.

Activity #1:

Note: Prior to turning on equipment power, the instructor is to remove the plug and cable connected to the Bally "E" Series power supply. This will enable the student to observe an actual machine trouble condition.

1. Turn on power.
2. Observe symptoms.
3. List observed symptoms:

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

4. Locate symptoms in appropriate Bally "E" Series trouble chart.
5. Perform indicated operations.
6. Identify the most logical fault.

Information:

All electronic gaming equipment problems can be located by utilizing these four logical steps:

1. Define the problem.
2. Localize the problem.
3. Isolate the problem.
4. Replace or repair the defective component.

Activity #2:

Note: Prior to turning on power, the instructor should partially remove the hopper assembly. This will enable the student to observe an actual machine trouble condition.

Activity #2: (continued)

1. Using the appropriate documentation, locate the trouble condition.
2. Perform system tests by "coining" the machine and playing it until a payout condition presents itself.
3. Using the Bally trouble flowcharts (see Appendix), determine the most logical fault.

Activity #3:

1. Repeat Activities #1 and #2 using the IGT Fortune II and 705 machines.

Posttest:

Same as Pretest

KEY

Pretest / Posttest:

- | | |
|------|-------|
| 1. T | 7. F |
| 2. T | 8. F |
| 3. F | 9. T |
| 4. T | 10. F |
| 5. F | 11. F |
| 6. T | 12. T |

Activity #1:

Correct answers will be determined by the instructor.

Identify Terms
and Symbols

Direct Instruction and Self-Taught Instruction

Job Skill:

Identify electronic component terms and symbols.

Objective:

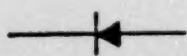
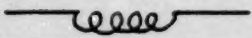
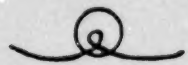
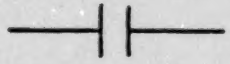
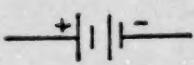
Correctly identify various electronic component terms and symbols.

Materials Needed:

1. Schematic Diagram - Bally "E" Series W-1046-2592 or equivalent
2. Electronic Component Symbols Identification Chart

Pretest:

Directions: Identify by name the following electronic component symbols:

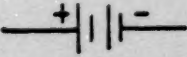
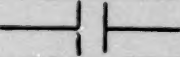
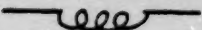
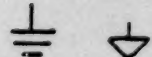
- | | | | |
|-----|---|-----|-------|
| 1. |  | 1. | _____ |
| 2. |  | 2. | _____ |
| 3. |  | 3. | _____ |
| 4. |  | 4. | _____ |
| 5. |  | 5. | _____ |
| 6. |  | 6. | _____ |
| 7. |  | 7. | _____ |
| 8. |  | 8. | _____ |
| 9. |  | 9. | _____ |
| 10. |  | 10. | _____ |
| 11. |  | 11. | _____ |
| 12. | AC | 12. | _____ |
| 13. | DC | 13. | _____ |
| 14. |  | 14. | _____ |

Information:

There are many different parts being used in electronics today. Most of these parts, however, perform electronically in similar fashion and can therefore be represented by common terms and symbols. The Bally "E" Series uses many of these symbols on their diagrams. Each Bally diagram is drawn so that each component of the diagram can be located by simply observing where the component is drawn relative to the coordinates found along the side and bottom.

The more common electronic terms and symbols that you will need to know are as follows:

ELECTRONIC COMPONENT SYMBOLS IDENTIFICATION CHART

SYMBOL	COMPONENT NAME	DEFINITION
1. AC	Alternating Current	Power source - Current in two directions
2. 	Battery	Power source
3. 	Capacitor	Energy storage
4. 	Coil	Electromagnetic energy
5. 	Diode	Allows current in one direction
6. DC	Direct Current	Provides current in one direction
7. 	Fuse	Predictable safety device
8. 	Ground	A common point
9. 	Integrated Circuit	Miniaturized electronics
10. 	Lamp (Bulb)	Indicator
11. 	Resistor	Current limiter
12. 	Switch	Controls energy
13. 	Transistor	Electronic switch

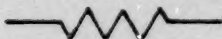
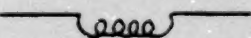
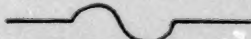
Activity #1:

1. Refer to the Electronic Component Symbols Identification Chart (above).
2. Open and spread the Bally "E" Series diagram on a flat surface.
3. Beginning in the lower left-hand corner of the diagram, identify how many numbers there are from left to right.
4. Beginning in the lower left-hand corner, identify how many letters there are from bottom to top.
4. Locate as many different components as possible and place them in this list:

	COMPONENT NAME	GRID COORDINATE
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____
9.	_____	_____
10.	_____	_____

Activity #2:

Locate the following components on the diagram and fill in their grid coordinates:

	SYMBOL/NAME	GRID COORDINATE
1.		_____
2.		_____
3.		_____
4.		_____
5.	Resistor	_____
6.	Coil	_____
7.	Switch	_____

Activity #2: (continued)

- 8. Fan
- 9. Power Plug
- 10. Winner Paid Light

Posttest:

Same as Pretest

KEY

Pretest / Posttest:

1. Switch
2. Diode
3. Coil
4. Lamp (Bulb)
5. Resistor
6. Capacitor
7. Ground
8. Ground
9. Transistor
10. Fuse
11. Battery
12. Alternating Current
13. Direct Current
14. Integrated Circuit

Activities #1 & #2:

Correct answers will be determined by the instructor.

Locate Electronic
Components

Direct Instruction and Self-Taught Instruction

Job Skill:

Locate electronic components on printed circuit boards.

Objective:

Correctly identify and locate different electronic components on printed circuit boards (PCB's).

Materials Needed:

1. A packet of an assortment of common electronic components which include:
 - 1.1 Resistors (2)
 - 1.2 Capacitors (2)
 - 1.3 Diodes (2)
 - 1.4 Integrated Circuits (2)
 - 1.5 Transistors (2)
 - 1.6 Bulbs (2)
 - 1.7 Battery (1)
 - 1.8 Switch (1)
 - 1.9 Fuse (1)
 - 1.10 Plug & Jack (1)
2. The following printed circuit boards from a Bally "E" Series Slot Machine:
 - 2.1 Power Supply PCB
 - 2.2 Input/Output PCB
 - 2.3 Microprocessor PCB
3. Pencil and roll of paper tape
4. Pictorial chart identifying electronic components (p. 5.4)

Pretest:

You will be given an assortment of the following items:

- Resistors
- Capacitors
- Diodes
- Integrated Circuits
- Transistors
- Bulbs
- Battery
- Switch
- Fuse
- Plug and jack
- Power supply PCB
- Input/Output PCB
- Microprocessor PCB

Correctly identify each component by writing its name on a piece of paper tape and sticking it to the component.

Answers will be evaluated by the instructor.

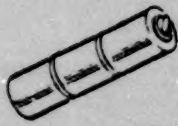
Activity #1:

1. Spread out the assortment of components on the table in front of you.
2. Using the pictorial chart, "Electronic Components" (on the following page), place the components in the following order from left to right:
 - 2.1 Resistors
 - 2.2 Capacitors
 - 2.3 Diodes
 - 2.4 IC
 - 2.5 Transistors
 - 2.6 Bulbs
 - 2.7 Battery
 - 2.8 Switch
 - 2.9 Fuse
 - 2.10 Plug-Jack
3. Have your instructor confirm your arrangement at this point.
4. Using the PCB's provided and the designations on each PCB, locate at least one of the following components and fill in the blank(s):

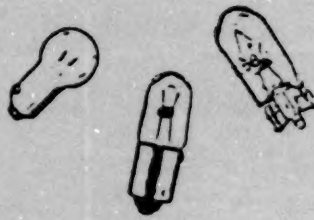
COMPONENT	DESIGNATION	PCB NAME
Switch	_____	_____
Battery	_____	_____
Diode	_____	_____
Transistor	_____	_____
Capacitor	_____	_____
Resistor	_____	_____

Posttest:

Same as Pretest. Answers will be evaluated by the instructor.



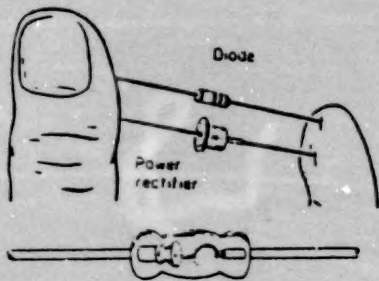
Battery



Bulbs



Capacitors



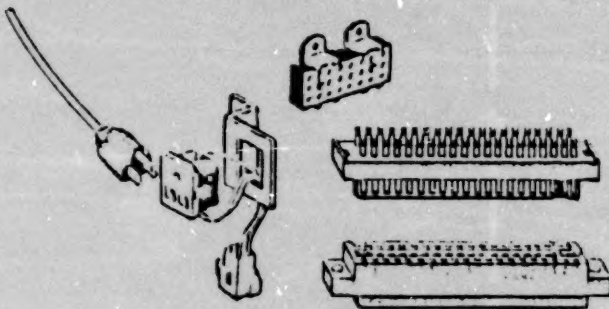
Diodes



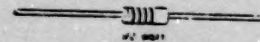
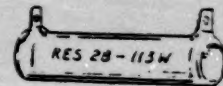
Fuses



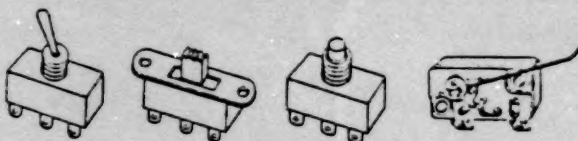
Integrated circuit



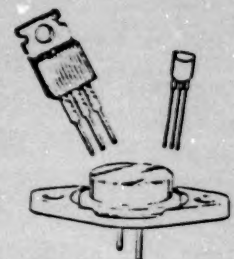
Plugs and jacks



Resistors



Switches



Transistors

Disassemble Major
Sub-Assemblies

Direct Instruction and Self-Taught Instruction

Job Skill:

Disassemble the major sub-assemblies of the various video poker/slot machines.

Objective:

Correctly remove the major sub-assemblies of the Bally "E" Series Electronic Slot, IGT Fortune II Video Poker, and IGT 705 Video Poker/Slot Machines.

Materials Needed:

1. Bally "E" Series Slot Machine
2. IGT Fortune II Video Poker/Slot Machine
3. IGT 705 Video Poker/Slot Machine
4. Bally Parts Catalog #7080
5. IGT Fortune II Service & Parts Manual
6. IGT 705 Service & Parts Manual
7. Flat Blade Screwdriver
8. Phillips Screwdriver

Pretest:

Directions: Using Manual #7080, identify the following parts:

1. Page 2 - Cabinet Assembly

ITEM #	DESCRIPTION
a _____	Bell Assembly
b _____	I/O Board Assembly
c _____	MPU Board Assembly

2. Page 6 - Front Door Assembly - Front View

a _____	Service Switch
b _____	Reel Glass
c _____	Coin Drop Casting
d _____	Fluorescent Lamp (General Illumination)
e _____	Payout Tray
f _____	Display Glass (Belly Glass)
g _____	Starter

3. Page 4 - Cabinet Assembly

a _____	Feature Glass
b _____	Convenience Outlet
c _____	Fuse Mounting Bracket
d _____	On/Off Switch
e _____	Power Supply Board
f _____	Exhaust Fan
g _____	Shadow Box (Insert and Lamp Socket Assembly)
h _____	Jackpot Switch (Meter Switch)

4. Page 8 - Front Door Assembly - Rear View

a _____	Coin Diverter Ramp
b _____	Electric Door Lock (Security)

Pretest: (continued)

ITEM #	DESCRIPTION
c _____	Door Lock
d _____	Coin Accept Lamp
e _____	Meter Display Board
f _____	Slug Rejector (Coin Acceptor)
g _____	Coin Switch and Wire Assembly

5. Page 10 - Hopper Payout Unit Assembly

a _____	5 AMP Fuse
b _____	Fuse Indicator Light
c _____	Hopper Control Board
d _____	Hopper Motor
e _____	Coin Counting Switch
f _____	Agitator
g _____	Wiper
h _____	Knife

Information:

One of the job skills of a slot technician is to be able to remove any of the major assemblies that are malfunctioning. In most cases this is an easy task. There are, however, several items that require the technician to exercise care. Please take all special precautions in the following activities.

Activity #1:

1. Open the door to the Bally slot machine and insure that all power is off.
2. Remove the hopper assembly.
3. Disconnect the cable to the power supply board.
4. Remove the two mounting screws holding the power supply board and remove the power supply board.
5. Slide the reel mechanism forward far enough for you to reach the two plugs connecting it to the system.
6. Unplug the two plugs and remove the reel mechanism.
7. Remove the reels from the reel mechanism by depressing the shaft latches and lifting the reel shaft.
8. Remove the mounting screws from each reel reader board.
9. Unplug each reel reader board and remove them from the reel mechanism.
10. Locate the four mounting screws holding the reel reader control board in place. Remove them, unplug the two connectors and remove the reel reader control board.

Information:

The gray flat cables used in the Bally Machine are bus cables. Extreme care must be taken when removing them. Never pull the plugs with your fingers. Instead gently pry the plugs loose using a flat blade screwdriver until they come apart. Never pull on the wires themselves.

Activity #2:

1. Locate the I/O board.
2. Remove all cable connections.
3. Remove the two mounting screws.
4. Remove the I/O board.

Activity #3:

1. Locate the MPU board.
2. Remove all cable connections.
3. Remove the two mounting screws.
4. Remove the MPU board.

Activity #4:

1. Remove the coin acceptor.

Information:

All of the glass used in electronic gaming equipment has fancy painted surfaces and care must be taken when handling these pieces because once they are scratched they are ruined.

Activity #5:

1. By pushing up on the glass retainer (item 41, page 4, Manual #7080), remove the feature glass.
2. Locate the six screws holding the frame window (item 32, page 6) and remove them.
3. Carefully remove the frame window and the reel glass.
4. Locate the two screws holding the display glass assembly (item 19, page 6) to the frame and remove them.
5. Carefully unplug all connectors to the display glass assembly and remove it.
6. Turn the display glass assembly upside down and remove the two screws holding the retainer frame (item 30, page 6) to the assembly.
7. Remove the retainer frame and belly (display) glass.

Activity #6:

1. Open door to the IGT Fortune II Video Poker/Slot Machine and insure that all power is off.
2. Remove the hopper assembly.
3. Locate the PCB card rack assembly and, if necessary, open the rack assembly door.
Note: These doors generally require the use of a key different than the front door key.
4. Remove the microprocessor board assembly.
5. Remove the interface board/sound board assembly.
6. Remove the coin acceptor.
7. Unplug and remove the picture (monitor) assembly.

Activity #7:

1. Open the door to the IGT 705 Video Poker Machine and insure that all power is off.
2. Remove the hopper assembly.
3. Unplug and remove the picture (monitor) assembly.
4. Locate the interface board mounted on the left side of the cabinet beneath the monitor assembly.
5. Remove all plugs and connections.
6. Remove the mounting screws and the interface board.
7. Locate the sound board mounted beneath the monitor assembly.
8. Remove all plugs and connectors.
9. Remove the mounting screws and the sound board.
10. Locate the card rack assembly holding the microprocessor PCB.
Note: The door to the microprocessor board generally has a lock and must be opened using a key different than the front door key.
11. Remove the microprocessor board assembly.
12. Remove the coin acceptor.

Information:

The flat cables used in this system are bus cables. Extreme care must be taken when removing them. Never pull the plugs with your fingers. Instead pry the plugs loose using a flat blade screwdriver until they come apart.

Posttest:

Under instructor supervision, disassemble the major sub-assemblies by removing the following items:

BALLY "E" SERIES ELECTRONIC SLOT

1. I/O PCB
2. Hopper Assembly
3. Power Supply
4. MPU PCB

IGT FORTUNE II

1. Coin Acceptor
2. Microprocessor PCB Assembly

IGT 705 VIDEO POKER/SLOT MACHINE

1. Hopper Assembly
2. Interface PCB
3. Sound PCB

KEY

Pretest:

1. Page 2 - Cabinet Assembly
 - a. 40
 - b. 14
 - c. 15
2. Page 6 - Front Door Assembly - Front View
 - a. 5
 - b. 31
 - c. 34
 - d. 23
 - e. 18
 - f. 29
 - g. 28
3. Page 4 - Cabinet Assembly
 - a. 38
 - b. 18
 - c. 30
 - d. 26
 - e. 23
 - f. 5
 - g. 35
 - h. 15
4. Page 8 - Front Door Assembly - Rear View
 - a. 42
 - b. 59
 - c. 7
 - d. 8
 - e. 30
 - f. 18
 - g. 57
 - h. 54
5. Page 10 - Hopper Payout Unit Assembly
 - a. 6
 - b. 7
 - c. 13
 - d. 24
 - e. 19
 - f. 33
 - g. 46
 - h. 26

Posttest:

Performance will be evaluated by instructor.

Reassemble Major
Sub-Assemblies

Direct Instruction and Self-Taught Instruction

Job Skill:

Reassemble the major sub-assemblies of the various video poker/slot machines.

Objective:

Correctly reassemble the major sub-assemblies of the Bally "E" Series Electronic Slot, IGT Fortune II Video Poker/Slot, and IGT 705 Video Poker Machines.

Materials Needed:

1. Bally "E" Series Slot Machine
2. IGT Fortune II Video Poker/Slot Machine
3. IGT 705 Video Poker Machine
4. Bally Parts Catalog #7080
5. IGT Fortune II Service & Parts Manual
6. IGT 705 Service & Parts Manual
7. Flat Blade Screwdriver
8. Phillips Screwdriver

Pretest:

Directions: Using Manual #7080, identify the following parts:

1. Page 2 - Cabinet Assembly

ITEM #	DESCRIPTION
a _____	Door Hinge Switch
b _____	Power Cord
c _____	Bell Assembly
d _____	Handle Mech Assembly
e _____	I/O Board Assembly
f _____	MPU Board Assembly

2. Page 6 - Front Door Assembly - Front View

a _____	Service Switch
b _____	Reel Glass
c _____	Coin Drop Casting
d _____	Fluorescent Lamp (General Illumination)
e _____	Payout Tray
f _____	Display Glass (Belly Glass)
g _____	Starter

3. Page 4 - Cabinet Assembly

a _____	Feature Glass
b _____	Convenience Outlet
c _____	Fuse Mounting Bracket
d _____	On/Off Switch
e _____	Power Supply Board
f _____	Exhaust Fan
g _____	Shadow Box (Insert and Lamp Socket Assembly)
h _____	43 Jackpot Switch (Meter Switch)

Pretest: (continued)

4. Page 8 - Front Door Assembly - Rear View

ITEM #	DESCRIPTION
a _____	Coin Diverter Ramp
b _____	Electric Door Lock (Security)
c _____	Door Lock
d _____	Coin Accept Lamp
e _____	Meter Display Board
f _____	Slug Rejector (Coin Acceptor)
g _____	Coin Switch and Wire Assembly

5. Page 10 - Hopper Payout Unit Assembly

a _____	5 AMP Fuse
b _____	Fuse Indicator Light
c _____	Hopper Control Board
d _____	Hopper Motor
e _____	Coin Counting Switch
f _____	Agitator
g _____	Wiper
h _____	Knife

Information:

One of the job skills of a Slot Technician is to be able to replace any of the major sub-assemblies that have been repaired. In most cases, this is an easy task. There are, however, several items that require the technician to exercise care.

Activity #1:

1. Place all the parts on the table near the machine cabinet.
2. Open the door to the Bally Slot Machine and insure that all power is off.
3. Locate the power supply board and place it into the track mounted on the back wall.
4. Secure the power supply PCB using two mounting screws.
5. Connect the power cable to the power supply PCB.
6. Locate and install the hopper assembly.

Activity #2:

1. Locate the reel reader control board and mount it inside the reel mechanism on the four mounting screws. (Insure that the PCB is held away from the frame by using four standoff insulators.)
2. Secure the PCB by using four (4) nuts.
3. Connect the signal cables to the two (2) input connectors.
4. Locate each reel reader board and mount them using the two mounting screws for each reader.
5. Connect the signal cables to each reel reader PCB.
6. Mount the reels onto the reel mechanism.

Activity #3:

1. Locate the I/O board and place it into the track mounted on the rear wall of the middle cabinet area.
2. Secure the I/O board using two (2) mounting screws.
3. Connect all plugs to the I/O board.

Caution: All plugs and connectors are FRAGILE - use extreme care.

Activity #4:

1. Locate the MPU board and place it in the track mounted on the left side of the middle cabinet area.
2. Secure the MPU board using two (2) mounting screws.
3. Connect all plugs to the MPU board.

Caution: All plugs and connectors are FRAGILE - use extreme care.

Activity #5:

1. Install the reel mechanism by sliding it on the tracks and push it far enough into the cabinet in order to connect the two (2) system plugs.
2. Once the plugs are connected, push the reel mechanism all the way to the rear of the cabinet and secure by means of the locking latches located on the front left and right sides of the mechanism.

Activity #6:

1. Install the coin acceptor.

Information:

All of the glass used in electronic gaming equipment has fancy painted surfaces and care must be taken when handling these pieces. Once they are scratched, they are ruined.

Activity #7:

1. Locate the feature glass and install the feature glass in the tracks on the top section of the cabinet.
2. Locate the display glass and mount it on the display glass assembly (item 11, page 6).
3. Install the retainer frame (item 30, page 6) and secure using two (2) screws.
4. Carefully mount the display glass assembly onto the door and secure using the two (2) mounting screws.
5. Connect all plugs and connectors.
6. Locate the reel glass and frame window (item 32, page 6) and install them on the front door.
7. Secure the frame window using six (6) mounting screws.

Activity #8:

1. Open door to the IGT Fortune II Video Poker/Slot Machine and insure that all power is off.
2. Locate and install the hopper assembly.
3. Locate the PCB card rack assembly and, if necessary, open the rack assembly door.
Note: These doors generally require the use of a key different from the front door key.
4. Install the microprocessor board assembly.
5. Install the interface board/sound board assembly.
6. Install the coin acceptor.
7. Install and connect the picture (monitor) assembly.

Activity #9:

1. Open the door to the IGT 705 Video Poker Machine and insure that all power is off.
2. Install the hopper assembly.
3. Install and connect the picture (monitor) assembly.

Caution: The flat cables used in this system are bus cables. Extreme care must be taken when removing them.

4. Locate the interface board and mount it on the left side of the cabinet beneath the monitor assembly area.
5. Connect all plugs and connections.
6. Install the mounting screws on the interface board.
7. Locate the sound board and mount it beneath the monitor assembly area.

Activity #9: (continued)

8. Install the mounting screws.
9. Connect all plugs and connections.
10. Locate the card rack assembly which holds the microprocessor PCB.
Note: The door to the microprocessor board generally has a lock and must be opened using a key different than the front door key.
11. Install the microprocessor board assembly.
12. Install the coin acceptor.

* Posttest:

Given the disassembled Bally "E" Series, IGT Fortune II, and IGT 705 machines, reassemble the major sub-assemblies and demonstrate to the instructor that the assembled machine works properly. This should be done without the assistance of either written or verbal instructions.

KEY

Pretest:

1. Page 2 - Cabinet Assembly

- | | |
|-------|-------|
| a. 5 | d. 21 |
| b. 37 | e. 14 |
| c. 40 | f. 15 |

2. Page 6 - Front Door Assembly - Front View

- | | |
|-------|-------|
| a. 5 | e. 18 |
| b. 31 | f. 29 |
| c. 34 | g. 28 |
| d. 12 | |

3. Page 4 - Cabinet Assembly

- | | |
|-------|-------|
| a. 38 | e. 23 |
| b. 18 | f. 5 |
| c. 30 | f. 35 |
| d. 26 | g. 15 |

4. Page 8 - Front Door Assembly - Rear View

- | | |
|-------|-------|
| a. 42 | e. 18 |
| b. 59 | f. 57 |
| c. 7 | g. 54 |
| d. 30 | |

5. Page 10 - Hopper Payout Unit Assembly

- | | |
|-------|-------|
| a. 6 | e. 19 |
| b. 7 | f. 33 |
| c. 13 | g. 46 |
| d. 24 | h. 26 |

Posttest:

Instructor will evaluate performance.

Conduct
Operational Tests

Direct Instruction and Self-Taught Instruction

Job Skill:

Install and conduct operational tests on the various video poker/slot machines.

Objective:

Correctly install and test the Bally "E" Series, the IGT Fortune II, and the IGT 705 Video Poker/Slot Machines.

Materials:

1. Bally "E" Series Slot Machine
2. IGT Fortune II Video Poker/Slot Machine
3. IGT 705 Video Poker Machine
4. Bally Operator Instructions Manual #FO-650-12
5. IGT Fortune II Service & Parts Manual
6. IGT 705 Service & Parts Manual

Pretest:

Directions: Circle the correct answer.

- | | | |
|---|---|---|
| 1. The Bally "E" Series can be plugged into a standard AC outlet. | T | F |
| 2. Due to cost reductions, the Bally "E" Series does not use a power on/off switch. | T | F |
| 3. There are only six tests that can be performed on the Bally "E" Series. | T | F |
| 4. IGT Fortune II units must be tested using a special test panel. | T | F |
| 5. IGT 705 units have no special tests. | T | F |
| 6. A 50 Code on a Bally "E" Series means a hopper jam has occurred. | T | F |
| 7. A tilt condition on a Bally "E" Series occurs when the coin switch is held too long. | T | F |
| 8. Using a special test, it is possible to predict coin payout on a Bally "E" Series. | T | F |
| 9. Using special tests, it is possible to predict coin payout on IGT poker machines. | T | F |
| 10. IGT Fortune II Video Slot Machines use mechanical meters for bookkeeping and Bally "E" Series Machines use electronic meters. | T | F |

Information:

This information applies to all Bally "E" Series, all IGT Fortune II, and IGT 705 Poker Machines.

BEFORE applying power for the first time...

1. Check all connectors for proper connection.
2. Be sure all socketed integrated circuits (IC's) are properly seated in the sockets.
3. Check for damage caused by mishandling during shipment.
4. Check for any information supplied with the machine for any special set up instructions.
5. ALWAYS turn the power OFF before removing or installing any assembly, connector, or component.
6. Use only manufacturer's recommended replacement parts.

Activity #1

BALLY "E" SERIES ELECTRONIC SLOT MACHINE:

1. Insert the AC plug into a standard 115V AC outlet.
2. Open the front door and, using the power on/off switch, turn the switch ON.

Information:

The Bally "E" Series is equipped with two types of test functions:

First, a diagnostic self-test when power is applied; and, second, a series of eight (8) manual tests.

These manual tests are numbered as follows:

1. Start of new game
2. Load test
3. Switch test
4. Hopper test
5. Reel reader test
6. Program test
7. Meter display test
8. Game functional test

Activity #2:

1. Using Bally "E" Operator Instructions Manual #FO-650-12, turn to page 6 and perform tests 1-8.
2. Upon completion of these tests, your instructor will ask you to close the door, lock it, and insert coins to play the game under actual operating conditions. You may keep all you win.

Activity #3:

IGT FORTUNE II VIDEO POKER/SLOT MACHINE:

1. Insert the AC power plug into a standard 115V AC power outlet.
2. Open the front door and, using the power switch, turn power on.

Information:

The Fortune II uses a special test panel to enter the various self-tests available. Once the game has been placed into self-test it must be cycled completely through all tests before returning to actual game conditions.

Activity #4:

1. Using the IGT Fortune II Service & Parts Manual, refer to pages 4-3, 4-4, and 4-5 and perform the following tests:
 1. Input test
 2. Output test
 3. Video test
 4. Sound test
2. Turn to page 4-5 and perform the following operational tests:
 1. Idle mode graphics
 2. Statistical display mode
3. Upon completion of these tests, your instructor will ask you to close the door, lock it, and insert coins to play the game under actual operating conditions. You may keep all you win.

Information:

The IGT 705 Video Poker Machine is an early version of the Fortune II and therefore does not contain all of the test capabilities of the Fortune II. There are, however, a number of tests that can be performed.

Activity #5:

IGT 705 VIDEO POKER MACHINE:

1. Insert the AC power plug into a standard 115V AC outlet.
2. Open the front door and turn power on using the power on/off switch.

Information:

The 705 does not have a special test panel, but does have test indicators located on the interface board (PCB) which is mounted on the left side of the lower (hopper) cavity.

Activity #6:

1. Using the IGT 705 Service & Parts Manual, turn to pages 6-1 thru 6-6 and perform the following tests:
 1. Cancel
 2. Display mode
 3. Coin in
 4. Deal
 5. Draw
 6. Hold 1 through hold 5
 7. Hopper full
 8. Jackpot reset
2. Upon completion of these tests, your instructor will ask you to close the door, lock it, and insert coins to play the game under actual operating conditions. You may keep all you win.

Posttest:

Under instructor supervision, conduct all operational tests on Bally "E" Series, IGT Fortune II, and IGT 705 machines.

KEY

Pretest:

1. T
2. F
3. F
4. T
5. F

6. F
7. T
8. T
9. F
10. T

Posttest:

Instructor will evaluate performance.

Identify Printed
Circuit Boards

Direct Instruction and Self-Taught Instruction

Job Skill:

Identify all the printed circuit boards and determine their interchangeability.

Objective:

Correctly locate and identify all printed circuit boards (PCB's) used in the Bally "E" Series Slot Machine, the IGT Fortune II and IGT 705 Video Slot/Poker Machines.

Materials:

1. Bally "E" Series Parts Catalog Manual #7080
2. IGT Fortune II Service & Parts Manual
3. IGT 705 Service & Parts Manual
4. All PCB assemblies from a Bally "E" Series Slot Machine
5. All PCB assemblies from an IGT Fortune II and IGT 705 Machine

Pretest:

Directions: Your instructor has separated the PCB's into separate groups (i.e., Bally parts, IGT Fortune II parts, and IGT 705 parts). Using the parts catalog and maintenance documents, identify each part and fill in the blanks in this list:

NAME	BALLY PART #
1. Hopper Control Board	_____
2. MPU Board	_____
3. I/O Board	_____
4. Display Board	_____
5. Reel Reader Board	_____
6. Reel Reader Control Board	_____
7. Sound Board	_____
	IGT FORTUNE II PART #
8. Microprocessor Board Assembly	_____
9. Sound/Interface Board Assembly	_____
	IGT 705 PART #
10. Sound Board	_____
11. Interface Board	_____
12. Microprocessor Board	_____

Circle the correct answer.

- | | |
|--|-------|
| 13. As a rule of thumb, it is good practice to interchange parts only with identical replacements. | T F |
| 14. Non-infrared reel reader boards are interchangeable in Bally "E" Series machines. | T F |
| 15. For most applications, IGT parts can be interchanged. | T F |

Activity #1:

BALLY "E" SERIES ELECTRONIC SLOT MACHINE:

1. Using visual observation of the machine, try to locate exactly where in the machine the part fits. This is analogous to a jigsaw puzzle.
2. Locate the drawing in the parts catalog that approximates the area of the machine that you have selected.
3. On the drawing, find the item number pointing to your part.
4. On the adjacent page, find the item number and confirm that the part number matches the part in your possession.
5. Repeat steps 1-6 for all PCB assemblies.

Activity #2:

IGT FORTUNE II and 705 VIDEO SLOT MACHINES:

1. Using the appropriate service manual's parts section, identify the part number of each board assembly.
2. Compare the part number from the manual with the number stamped on the assembly.
3. Repeat steps 1 and 2 for all PCB assemblies.

Information:

As a rule of thumb, it is good practice to interchange parts only with identical replacements. This is always true for all IGT equipment. However, many Bally "E" Series parts can be interchanged. The following list describes those parts:

INTERCHANGEABLE PARTS

1. Display board
2. Lamp driver board
3. Reel reader board (non-infrared)
4. Reel reader control board
5. I/O board - Observe jumpers S1-2, S4-5
6. MPU board - Provided all PROM's (Programmable Read Only Memory) are identical. Observe appropriate jumpers.

NON-INTERCHANGEABLE PARTS

1. Hopper control board
2. Sound board - Replace with same part numbers only
3. RAM board - Must take old and new meter readings
4. MPU - Requires M1, M2, M3, M7 to be changed
 - Requires piggy-back RAM board
 - Requires piggy-back lamp driver
 - Observe whether old or new style MPU is in the unit

Note: There is a definite relationship between the mechanics of the reel mechanism assembly, i.e., springs (blue, silver, red), trip lever, etc., AND the electronics timing of the computer. Problems that develop from this relationship result in codes 71, 72, 73 or 91, 92, 93. Please see instructor for further details.

Activity #3:

1. Using the interchange list and PCB's, point out to your instructor those boards that are interchangeable.
2. Using the interchange list and PCB's, point out to your instructor those boards that are interchangeable with minor modifications.
3. Using the interchange list and PCB's, point out to your instructor those boards that are NOT interchangeable.

Posttest:

Directions: Circle the correct answer:

- | | | |
|--|---|---|
| 1. All IGT parts are interchangeable within all IGT equipment. | T | F |
| 2. A Bally reel reader control board is interchangeable with any other Bally reel reader control board. | T | F |
| 3. Bally power supplies are interchangeable. | T | F |
| 4. Bally hopper control boards are interchangeable. | T | F |
| 5. It is good practice to use only identical parts when swapping. | T | F |
| 6. The IGT Fortune II sound board and interface board are on the same assembly. | T | F |
| 7. Bally I/O boards are interchangeable provided care is exercised in observing correct jumper locations. | T | F |
| 8. Reel reader boards using light bulbs and photo transistors are interchangeable | T | F |
| 9. IGT 705 Video Poker equipment has separate interface and sound assemblies. | T | F |
| 10. Bally microprocessor PCB's and IGT microprocessor boards are identical because they both use microprocessor chips from the same manufacturer. | T | F |
| 11. Under instructor supervision, point out and identify by name each printed circuit board in the Bally "E" Series, IGT Fortune II, and IGT 705 machines. Also point out which PCB's are directly interchangeable and those that are NOT interchangeable. | | |

KEY

Pretest:

BALLY PART

1. AS 2981-1
2. AS 2978-3
3. AS 2980-5600
4. AS 2985-2
5. AS 2977-1
6. AS 2983-1
7. AS 2518-130

IGT FORTUNE II PART

8. 7570190
9. 7610070 / 7541450

IGT 705 PART

10. 761 003 00
11. 759 005 00
12. 757 005 00

13. T
14. T
15. F

Posttest:

- | | |
|------|-------|
| 1. F | 6. T |
| 2. T | 7. T |
| 3. T | 8. F |
| 4. F | 9. T |
| 5. T | 10. F |

11. Instructor will evaluate answers.

Demonstrate
Soldering Techniques

Direct Instruction and Self-Taught Instruction

Job Skill:

Demonstrate basic soldering techniques.

Objective:

Correctly perform the following soldering tasks:

1. Solder a wire to a terminal mounted in a printed circuit board.
2. Solder a wire into a printed circuit board.
3. Solder a transistor or integrated circuit into a printed circuit board.
4. Solder two wires together.
5. Unsolder a component from a printed circuit board.

Materials Needed:

1. Bus wire, solid wire, stranded wire
2. Soldering iron
3. Soldering tools, tweezers, wire strippers, long nose pliers
4. Solder with flux
5. Printed circuit boards (PCB's)
6. Clean rags

Pretest:

Directions: Read each statement carefully and circle the correct response.

1. Solder joints are used to make:
 - a. mechanical connections only
 - b. electric connections only
 - c. electric and solder connections only
 - d. terminal electric bonds
2. Part of a soldering iron that must be tinned is the:
 - a. handle
 - b. tip
 - c. heating element
 - d. connection between the handle and tip
3. The best way to clean the solder off the tip of a soldering iron is to:
 - a. shake it
 - b. wipe it off with a wet sponge
 - c. rub it off with a file
 - d. wash it off with soap and water
4. When soldering a component lead onto a terminal, the soldering tip should be placed against the lead and terminal:
 - a. on the opposite side of the point where the solder is to be placed
 - b. on the same side where the solder is to be placed
 - c. and pushed hard to make sure there is a good heat connection
 - d. and left a good length of time to make sure that there is plenty of solder on the terminal
5. The conductive pattern of a printed circuit board is:
 - a. always on one side of the board if it is to meet MIL standards
 - b. not heat sensitive
 - c. generally made of sheet silver
 - d. generally made of sheet copper
6. When soldering an electronic component, the:
 - a. leads should be cut to length before the solder is applied
 - b. leads should be cut off after the solder has been applied
 - c. lead bend should begin very close to the body of the component
 - d. leads should make at least 1-1/2 turns around the terminal

Pretest: (continued)

7. A soldering heat sink is used for:
 - a. conducting the heat away from components
 - b. cleaning the soldering iron
 - c. any form of soldering
 - d. resistance soldering only
8. An important tool in removing components which have been soldered into place is:
 - a. a screwdriver
 - b. dikes
 - c. a desoldering tool
 - d. wire strippers

Information:

A part of this job will be to repair/replace electronic circuits and parts by making mechanical and electrical connections (called solder joints). Only on very small parts can the mechanical connection be made with solder only. In most cases, the parts must be mechanically fastened before the solder is applied. Only in special cases can solder alone be relied on to hold wires together.

Activity #1:

1. Get the electric soldering iron out and screw the tip into the electric heating element.



PENCIL SOLDERING IRON

2. Plug your soldering iron into an outlet.

Caution: The iron must get to above 370 F before it will melt solder. This is hot enough to burn insulation on wire or start a fire. Therefore, keep the iron in its holder when not using it.

3. Clean the tip with a clean rag while the iron is getting hot. When finished, the tip should be bright and clean.
4. Get out solder and sponge. Wet the sponge with water.
5. Check to see if the soldering iron is hot by touching the iron with solder. It should melt and flow onto the tip.

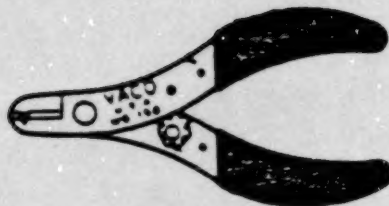
Information:

The solder being used has rosen flux put into it to clean the surface so the solder will stick.

6. Tin the soldering iron: Rub the solder on the soldering iron tip. After the tip is completely covered, wipe it off on the sponge. The tip should be a shiny silver. Always keep it that way.

Information:

Preparing and connecting wires is one of the Slot Technician's most important tasks. To make an electric connection, the insulation on a single copper wire must be removed. This is done with a fixed length wire stripper. Only the amount of insulation that is necessary to make the electric connection is removed.



FIXED LENGTH WIRE STRIPPERS

Activity #2:

1. Cut the insulation on a wire with the wire cutters. Use a hole that, when closed, is just a little bigger than the bare copper wire.
2. Complete the operation by slightly opening the cutter and sliding off the insulation.

Note: If the wire is nicked or scraped, the cutter opening was too small. If the insulation did not pull off easily, the hole was too large.

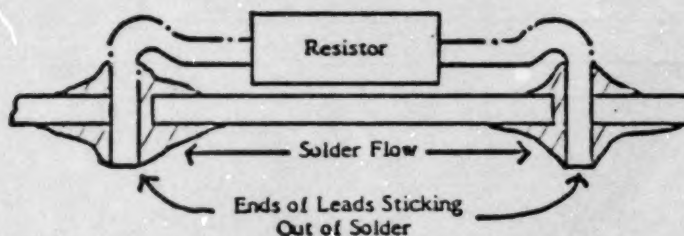
3. Repeat steps 1-2 on several wires.

Information:

The printed circuit board (PCB) is a piece of plastic with a conductive pattern made of copper bonded to one or both sides. To solder to the printed circuit board, you use the principles of soldering you have learned. Be careful not to use too much heat - the conductive pattern may lift off.

Activity #3:

1. Place a resistor on a PCB using a long-nose pliers to bend the leads to fit.



2. Solder the leads in place at the hole in the conductive system. Keep a small amount of solder on the tip of the iron to heat the joint quickly. Touch the solder and iron tip together from opposite sides of the lead, applying only enough heat to get the solder to flow.

Caution: Do not move the component leads or the PCB until the solder cools.

Information:

In a good solder joint, the solder should flow up onto the resistor leads and out onto the conductive pattern. It should cover the conductive pattern pad with just a little buildup where the lead comes out of the hole in the board.

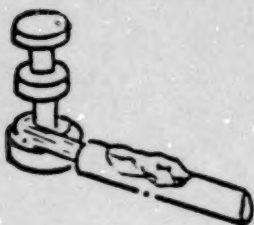
3. Cut off the leads next to the solder.
4. Solder five components onto the PCB. The instructor will check the solder joints.



Insulation Damage



Solder Spill



Damaged Insulation



Insufficient Wire Wrap

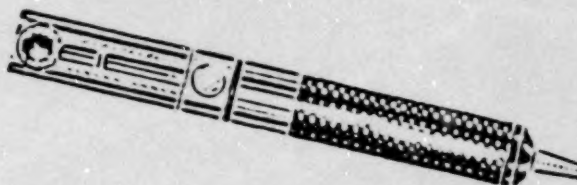
POOR SOLDER CONNECTIONS

Information:

In removing previously installed components or correcting poor solder connections, the joints will have to be unsoldered.

Activity #4:

1. Heat one of the solder connections on a PCB with the soldering iron.
2. The solder connection should have very little solder left on it. Remove the melted solder with the desoldering tool.



DESOLDERING TOOL

3. Move the lead with your long-nose pliers before it cools. This will break up the remaining solder and loosen the connection.
4. Repeat steps 1-3 for the other lead connections.
5. Remove the component from the PCB.
6. Unsolder five components without breaking the leads, damaging the conductive pattern, or nicking the surface of the printed circuit boards.

Posttest:

You will be given a printed circuit board with two (2) components soldered in place. You are to correctly unsolder these components and remove them.

Then you are to reinstall and solder these same components and complete this activity in ten minutes. At the end of ten minutes, you are to stop soldering and turn your PCB over to your instructor.

KEY

Pretest:

1. c
2. b
3. b
4. a

5. d
6. b
7. a
8. c

Posttest::

The instructor will evaluate your performance.

Use of a
Digital Multimeter

Direct Instruction and Self-Taught Instruction

Job Skill:

Use a digital multimeter to measure appropriate machine voltages and resistances.

Objective:

Correctly demonstrate the proper use of a digital multimeter to measure machine voltages and resistances.

Materials Needed:

1. Digital Multimeter
2. Bally "E" Series Slot Machine

Pretest:

Directions: Circle the correct answer:

- | | | |
|--|---|---|
| 1. A device used to measure resistance, voltage, and current is called a multimeter. | T | F |
| 2. In order to measure voltage, the meter must be connected in parallel with a circuit. | T | F |
| 3. When measuring DC voltage, you must observe polarity. | T | F |
| 4. When measuring alternating voltage, the selector switch must be on AC volts. | T | F |
| 5. When measuring resistance, the most critical thing to remember is to turn the power off. | T | F |
| 6. When measuring resistance, the meter reads 00.0 - this indicates a short circuit. | T | F |
| 7. It is unnecessary to observe any precautions when measuring resistance. | T | F |
| 8. When measuring an unknown AC voltage, you would use the lowest value position on the AC scale. | T | F |
| 9. When measuring AC voltage, if the meter reads 12.0 and you are on a 500V range, the value measured is 120V. | T | F |
| 10. When measuring resistance between a wire and the chassis of a machine, a 00.0 reading would indicate that they were connected. | T | F |

Information:

The multimeter combines the separate functions of ohmmeter (resistance measurement), ammeter (current measurement), AC voltmeter (alternating current voltage measurement), and DC voltmeter (direct current voltage measurement). As this course is not for electronic technicians, only a small amount of the multimeter's capability will be explored.

Activity #1:

1. Insure that all power is off on the Bally Slot Machine.
2. Open the front door of the machine.

Note: As a general rule, it is good practice to use a black lead as a common (ground lead), and therefore it is inserted in the common point on the meter. A red lead (hot) is usually used to measure voltage.

3. Turn the multimeter on.
4. Select the lowest position on the resistance scale (ohms scale).
5. Place the black lead onto the chassis anywhere near the hopper assembly.
6. Place the red lead on the reel mechanism assembly.
7. Record your findings: _____ ohms

Information:

In the preceding activity, there should have been a reading of 00.0 ohms indicating that the chassis of the machine and the frame of the reel are electrically connected. This is the same indication you would get if any two points are "short" circuited together.

Activity #2:

1. Insure the power is still off.
2. Select the lowest position on the resistance scale.
3. Place the black lead onto the COM connection of the "coin in" microswitch.
4. Place the red lead onto the N/O connection of the "coin in" microswitch.
5. Record your findings: _____ ohms
6. Using your finger, depress the "coin in" microswitch whisker.
7. Record your findings: _____ ohms

Note: In the preceding steps you should have observed the open and closed positions of the microswitch indicated on your meter.

Activity #3:

1. Turn power on.
2. Select the DC scale.
3. Select a position on the DC scale that will measure up to 50V DC.

Activity #3: (continued)

Information:

Since you are measuring DC volts, it is necessary to observe polarity.

4. Place the black lead anywhere on the chassis frame.
5. Place the red lead on the +5V pin on the slot machine power supply.
6. Record your findings: _____ DC volts
7. Remove your leads.

Activity #4:

Information:

You are about to measure AC volts. It is not necessary to observe polarity.

1. Select the AC volts scale.
2. Select a position on the AC volts scale that will measure up to 500V AC.
3. Locate in the room any AC wall outlet.
4. Very carefully (avoid shorting your leads together) insert the black lead into one side of the outlet and the red lead into the other.
5. Record your findings: _____ AC volts.

Posttest:

Same as Pretest

KEY

Pretest / Posttest:

- | | |
|------|-------|
| 1. T | 6. T |
| 2. T | 7. F |
| 3. T | 8. F |
| 4. T | 9. F |
| 5. T | 10. T |

Activities #1 - #4:

The instructor will verify the answers.

Use Commercial
Testing Equipment

Direct Instruction and Self-Taught Instruction

Job Skill:

Conduct tests on the various video poker/slot machines.

Objective:

Correctly demonstrate the use of Bally-manufactured testers and IGT-manufactured testers to test the PCB assemblies used in the Bally "E" Series Electronic Slot and the IGT Fortune II Video/Slot Machines.

Materials Needed:

1. Bally Peripheral Test Manual #FO-650-210
2. IGT Fortune II Test Manual (8051)
3. Bally Peripheral Tester
4. IGT Fortune II Tester (8051)
5. Bally Reel Mechanism Assembly
6. Bally Hopper Assembly

Pretest:

Directions: Circle the correct answer.

- | | | |
|--|---|---|
| 1. The Bally Peripheral Test Station is a device for testing PCB's. | T | F |
| 2. The Bally Peripheral Test Station can perform all eight tests found in a Bally "E" Series Slot Machine. | T | F |
| 3. It is necessary to turn off power when removing any PCB assembly. | T | F |
| 4. The Bally tester can be used to duplicate actual game conditions | T | F |
| 5. The IGT Fortune II tester will also test IGT 705 parts. | T | F |
| 6. The IGT Fortune II tester can test video poker and video slot PCB's. | T | F |
| 7. The Bally Peripheral tester can test all Bally "E" Series PCB's. | T | F |
| 8. The IGT Fortune II tester can simulate actual game conditions. | T | F |

Information:

The Bally Peripheral Test Station can duplicate the eight (8) tests that can be performed by the Bally "E" Series Slot Machine. What it cannot do, however, is duplicate game conditions as it does not have a "start of new game" capability or a handle to operate.

Activity #1:

1. Using the Bally Peripheral Test Station Operator Guide, read pages 1 through 8.
2. Place a known good input/output PCB onto the station and connect it into the unit. Use Figure 2.2 to confirm proper connection.
3. Perform I/O board output test #2 by following the instructions on page 10, paragraph 3.2.
4. List the code number of any output port or bit that fails:

4.1. _____

4.2. _____

4.3. _____

4.4. _____

4.5. _____

Note: If any port or bit fails, notify the instructor before proceeding.

Activity #2:

1. Perform I/O board input test #3 by following the instructions on page 12, paragraph 3.2.4.
2. List the code number of any input port and bit that fails.

2.1. _____

2.2. _____

2.3. _____

Activity #3:

1. Perform test #1 by depressing the test button once. The Program ID Code produced is: _____.
2. Perform test #4 by following the instructions on page 41.
3. Perform test #5 by following the instructions on page 27, paragraph 5.2.

Information:

The IGT 8051 tester is designed to test IGT Fortune II circuit boards (PCB's). The tester is basically a Fortune II unit with the additional capabilities of digital voltmeter to monitor AC line voltages and powers at autotransformer control to vary power output of the main transformer to simulate over and under voltage situations.

Activity #4:

1. Using the IGT Fortune II (8051) Tester Manual, the student should read pages 1-1 through 1-4 and become familiar with the tester operating controls and indicators.
2. Turn on AC power and set the voltage for 115VAC using the power-stat control.

Information:

The IGT 8051 is more properly called an exerciser in that its primary purpose is to exercise all machine functions as though it were a slot machine, rather than testing for specific items.

Activity #5:

1. Turn to page 1-8, figure 1-3, "Overlay Information."
2. Compare this figure to the front panel of the tester.
3. Depress "coin in" and observe the lights.

Note: If the PCB's in the tester are for poker, it will be necessary to depress "deal/draw" for the tester to function. If the PCB's are for slot machine, it will be necessary to depress "handle cock" followed by "handle spin" in order for the tester to function.

4. Continue depressing the various pushbuttons to observe game operations.

Information:

The IGT Fortune II Tester (8051) will exercise Fortune II parts only. It is important to turn off power when removing or replacing PCB's.

Posttest:

Written portion same as Pretest.

Hands-on portion:

Given a PCB provided by the instructor and using the appropriate test manual, determine whether the board is good.

KEY

Pretest / Posttest:

- | | |
|------|------|
| 1. T | 5. F |
| 2. T | 6. T |
| 3. T | 7. F |
| 4. F | 8. T |

Activities #1, 2, and 3, and Hands-on Posttest:

The instructor will verify your answers.

Conduct Preventive
Maintenance

Direct Instruction and Self-Taught Instruction

Job Skill:

Conduct preventive maintenance on the various video poker/slot machines.

Objective:

Correctly demonstrate accepted preventive maintenance procedures on the Bally "E" Series Slot, IGT Fortune II Video Poker/Slot, and IGT 705 Video Poker Machines.

Materials Needed:

1. Bally "E" Series Slot Machine
2. IGT Fortune II Video Poker/Slot Machine
3. IGT 705 Video Poker Machine
4. Bally Lubrication and Adjustment Manual #7150
5. IGT Fortune II Service & Parts Manual
6. IGT 705 Service & Parts Manual

Pretest:

Directions: Fill in the blanks.

1. From a management perspective, one of the more desirable forms of maintenance is called _____ maintenance.
2. _____ maintenance allows for maintenance to be performed on a regularly scheduled basis, thereby reducing the number of emergency (remedial) maintenance.
3. _____ maintenance is undesirable because it is expensive and creates scheduling and customer problems.
4. The best test of operational capabilities is _____ acceptance.
5. The primary cause of service calls on any gaming device is a non-functional _____.
6. On those devices with few moving parts, primary maintenance consists largely of _____ and _____.
7. The second most frequent cause of service calls on any gaming device is a _____ problem.
8. Devices with moving parts, such as relays, gears, switches, reels, and brakes, require more maintenance than other devices. The best type of maintenance for these devices is _____ maintenance.

Information:

Since the beginning of the industrial age, there has been a need for a little-understood, often-ignored service activity known as preventive maintenance or PM.

Preventative maintenance, or PM, is often ignored because it seems costly and shows no immediate dollar value to a company's bottom line. However, the lack of PM results in longterm breakdowns and equipment outages which do directly impact on a company's bottom line. Lately, saving-conscious managers have been establishing PM programs to offset the extremely high cost of remedial or corrective maintenance.

Activity #1:

1. Open the front door of the IGT 705 Draw Poker Machine.
2. Open the IGT 701/705 Draw Poker Maintenance Manual to page 5-5 and perform the steps in paragraphs 5-18 through 5-35.

Information:

As you can see, most of the maintenance consists of cleaning and visual inspection.

3. Perform the steps in paragraphs 5-40 through 5-42.

Information:

Remedial or corrective maintenance may be more interesting for the Slot Technician, but it is costly and undesirable. The IGT Fortune II Maintenance Manual does not specify preventive maintenance, but rather lends itself to the more costly remedial maintenance activities. However, several preventive maintenance activities can be accomplished using the manual.

Activity #2:

1. Open the door to the IGT Fortune II Poker/Slot Machine.
2. Turn to page 5-5 in the IGT Fortune II Maintenance Manual and perform the steps in the following paragraphs:
 - 2.1. Bowl eccentric
 - 2.2. Knife adjustment
 - 2.3. Coin wiper
 - 2.4. Bowl weight switch
3. Turn to page 5-6 and perform the coin counting switch adjustment.
4. Turn to page 5-7 and perform the following paragraphs:
 - 4.1. RGB monitor adjustments:
 - 4.1.1. Color
 - 4.1.2. Gain
 - 4.1.3. Horizontal adjustment
 - 4.1.4. Vertical size and linearity

Information:

Mechanical and electromechanical devices require much more in the way of preventive maintenance. The Bally "E" Series Slot Machine is such a device.

Activity #3:

1. Using the Preventive Maintenance Schedule (see Appendix), perform PM on the Bally "E" Series Slot Machine. When adjustments are necessary, refer to Manual #7150 - Bally Electronic Slot Machine.

Posttest:

Same as Pretest.

KEY

Pretest / Posttest:

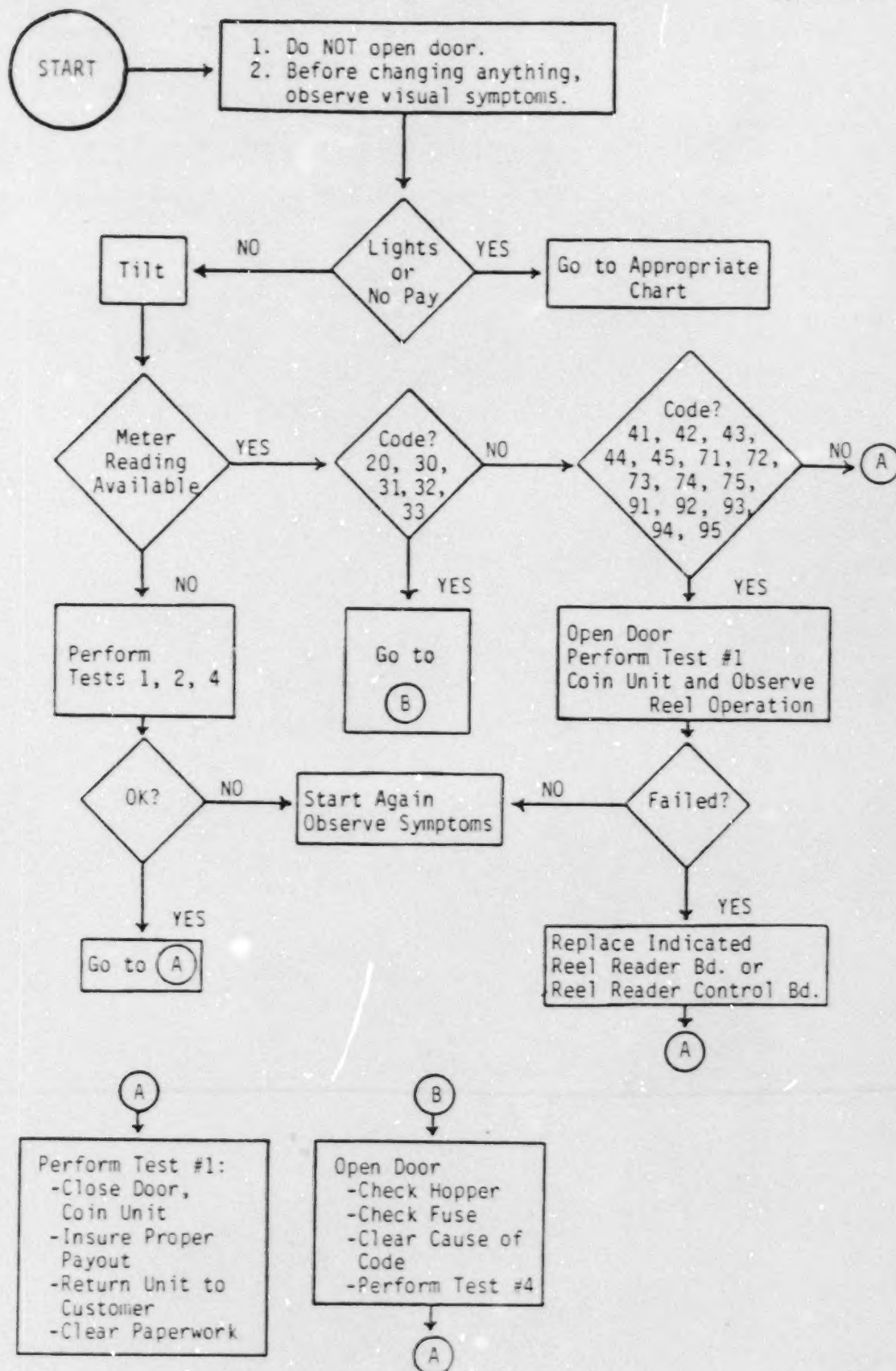
1. preventive
2. Preventive
3. Emergency (Remedial)
4. customer
5. coin acceptor
6. cleaning, inspection
7. hopper
8. preventive

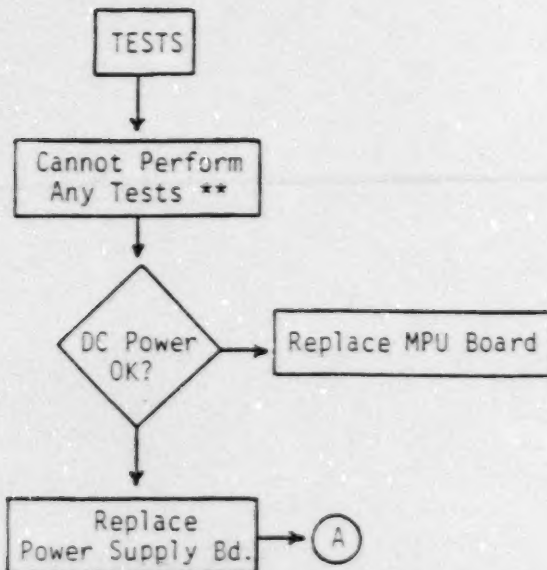
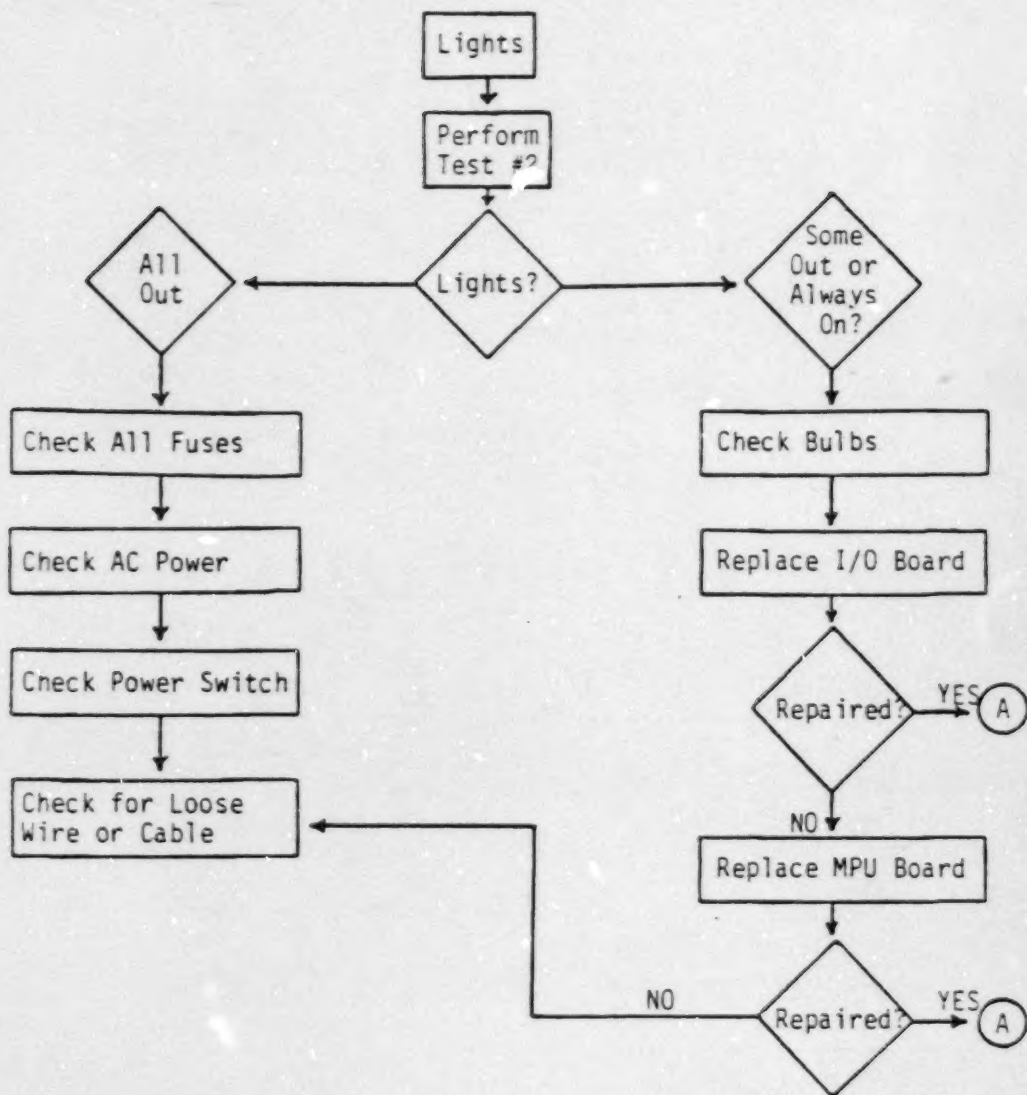
APPENDICES

ELECTRONIC GAMING EQUIPMENT REPAIR

"SLOT TECH"

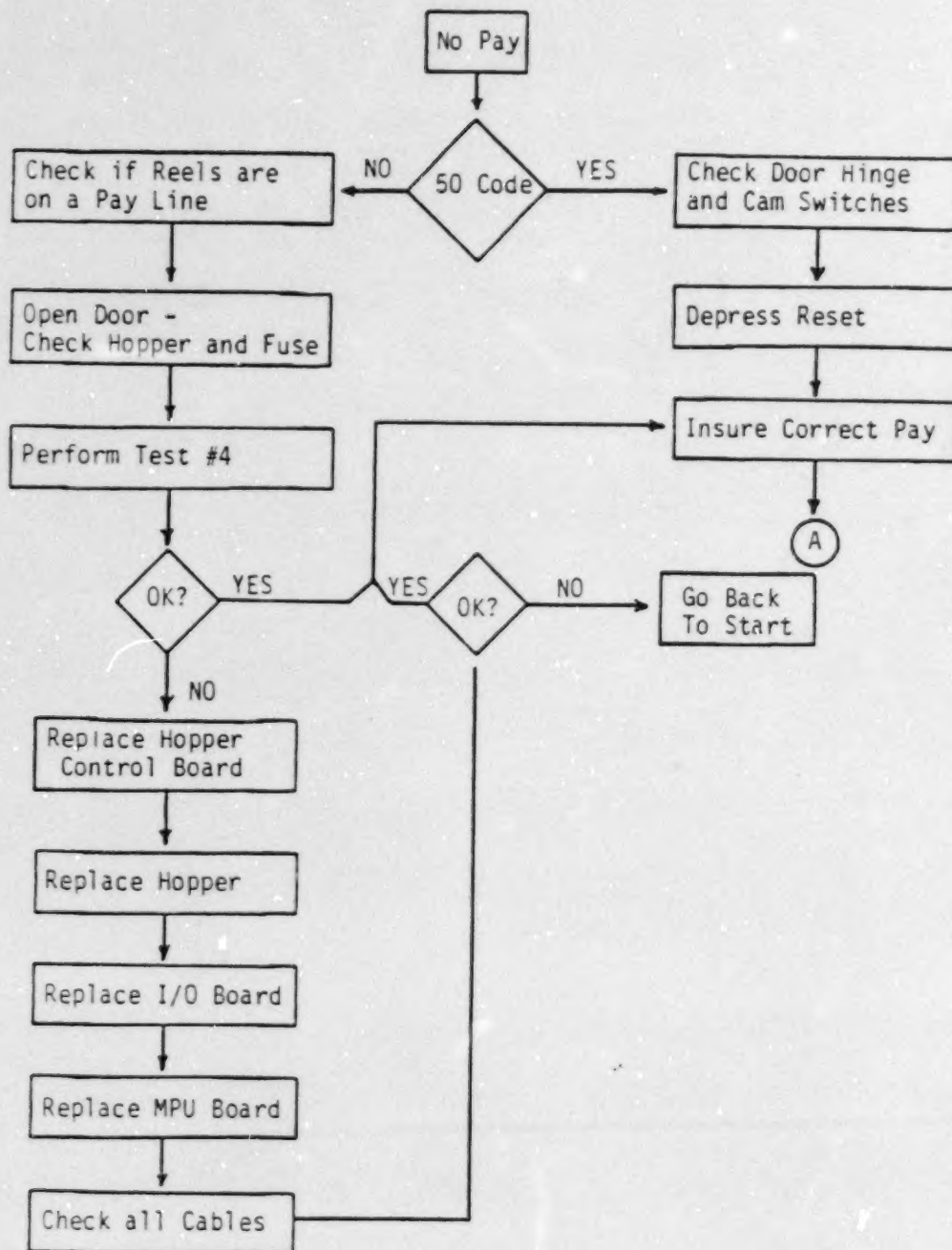
1. The most important duty of a mechanic is to keep the machines on the floor operating correctly. This must be done in a professional manner and with a minimum of downtime.
2. You are responsible for keeping your tool cart clean, neat and well-stocked with parts.
3. The Slot Shop will be cleaned and picked up every shift, everyday. It must be kept neat and orderly at all times.
4. Coin acceptors will be repaired by all mechanics, all shifts.
5. When you replace a reel mechanism or handle box, you have two (2) working days to rebuild it.
6. It is the responsibility of ALL mechanics to insure that the correct amount of parts are in stock at all times. On special orders or if you are not sure about the order, tell your lead-man so that he can inform the head mechanic.
7. Video monitors and glass will normally be cleaned by mechanics.
8. Keep all the lights in the machines working and make sure the reel tapes are clean, not yellow, and in good condition. This is a MUST!
9. If requested by the shift supervisor to help the floorpeople, you will do so as long as no machines are down. You will not do floor work unless requested. This does not apply to signing as an "extra" on jackpots.
10. Any jackpot \$1000 or larger will be verified by a mechanic.





** NOTE: Be sure to check that the test & reset switches are functional.

TROUBLE FLOWCHART #3



PREVENTIVE MAINTENANCE SCHEDULE

Bally "E" Units

Machine # _____

Date _____

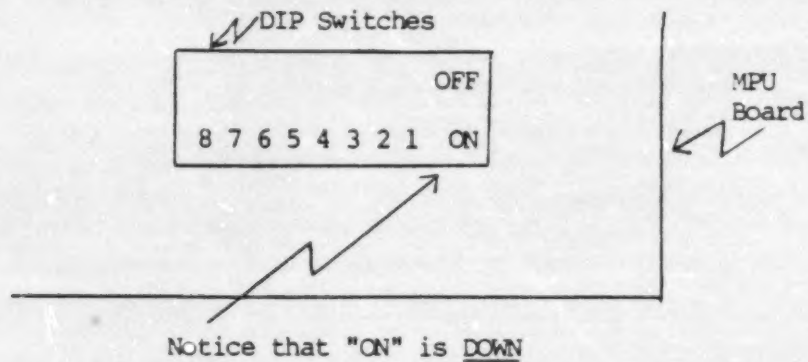
INITIALS

OPEN UNIT - REMOVE REEL ASSEMBLY	_____
1. Wipe off excess grease and grime.	_____
2. Clean interior.	_____
3. Clean cables.	_____
4. Inspect all cable connections to modules.	_____
5. Clean reel assembly	_____
6. Lubricate:	
- Reels with LPS 1 geaseless lubricant.	_____
- Gears with Special JK Gel	_____
- Handle mechanism with Special JK Gel on heavy-duty points	_____
- LPS 1 on light-duty points and slides	_____
7. Check:	
- Air cylinder operation.	_____
- If reels spin freely.	_____
- If tapes are secure and "aligned"	_____
REINSTALL REEL ASSEMBLY.	_____
REMOVE HOPPER UNIT	_____
1. Wipe off residue and scum (Power Foam).	_____
2. Inspect cabinet bottom for coins, nuts, screws, slugs, etc.	_____
3. Clean cabinet bottom.	_____
4. Check:	
- Hopper knife.	_____
- Hopper microswitch.	_____
5. Lubricate coin switch roller and rocker pivot with light	
machine oil (Bally oil)	_____
REINSTALL HOPPER UNIT.	_____
FRONT DOOR	
1. Clean all surfaces.	_____
2. Check, clean, and lubricate coin acceptor	_____
3. Observe all connectors and solder points.	_____
4. Watch for frayed or broken wire	_____
ELECTRONIC PM - UNIT TESTS	
- 5 ... When "Mystery Pays" or "Failures to Pay" occur, use	
this test to verify reel position data	_____
- 8 ... When incorrect pay is suspected, use this test to	
confirm payoffs.	_____
- 4 ... 10-coin payout	_____
- 2 ... Check unit response, replace bulbs, etc., as required.	_____
- 1 ... New game, check unit reset ("50.0.00" Door Open) . . .	_____
CLOSING UNIT	
1. Clean inside glass.	_____
2. Clean glass surfaces (top and bottom)	_____
3. Clean all shiny surfaces, remove all fingerprints, stains .	_____
4. Coin the unit	_____
5. Close and lock.	_____
6. Check unit operation.	_____

** WRITE UP MECHANICS REPORT IF REPAIR IS NECESSARY **

(This check sheet is ONLY for PM work.)

MPU Board - "E" Series - DIP Switch Setting



<u>Switch No.</u>	<u>ON</u>	<u>OFF</u>
1	Jackpot Bell	Jackpot Gong
2	Feature lamps reset after 3 minutes of no play.	Any feature lamps lighted at end of game remain lighted until next game.
3, 5, 6	Various combinations of attendant pays. (See specific model information in shop.)	All pays by machines.
4	Ring bell on all pays.	Ring bell on certain combinations of pays. (See specific information in shop.)
7	Not used at present.	
8	Must be ON in game operation.	



MOHAVE COMMUNITY COLLEGE

This is to Certify that

has completed _____ hours of instruction

in _____

CERTIFICATE OF COMPLETION

Kingman, Arizona, This _____ Day of _____ 19 _____

INSTRUCTOR

DEAN OF INSTRUCTION

STATEMENT OF COMPETENCY

MOHAVE COMMUNITY COLLEGE
ARIZONA

Minimal Competencies Achieved by _____

**Upon Completion Of The Program The Student
Demonstrated The Ability To:**

1. Describe illegal electronic gaming activities.
2. Identify the location and purpose of the major assemblies and sub-assemblies of the Bally "E" Series electronic slot; the IGT Fortune II video poker/slot; and the 709 video poker machines.
3. Trouble shoot to the sub-assembly level the Bally "E" Series electronic slot; the IGT Fortune II video poker/slot; and the 709 video poker machines.
4. Identify electronic component terms and symbols.
5. Locate electronic components on the printed circuit boards.
6. Disassemble the major sub-assemblies of the Bally "E" Series electronic slot; the IGT Fortune II video poker/slot; and the 709 video poker machines.
7. Reassemble the major sub-assemblies of the Bally "E" Series electronic slot; the IGT Fortune II video poker/slot; and the 709 video poker machines.
8. Install and conduct operational tests on the Bally "E" Series electronic slot; the IGT Fortune II video poker/slot; and the 709 video poker machines.
9. Identify all the printed circuit boards and determine their interchangeability.
10. Demonstrate correct soldering techniques.
11. Demonstrate proper use of a digital multimeter to measure the appropriate machine voltages and resistances.
12. Conduct tests on the Bally "E" Series electronic slot; the IGT Fortune II video poker/slot; and the 709 video poker machines using the appropriate commercial testing equipment.
13. Conduct preventive maintenance on the Bally "E" Series electronic slot; the IGT Fortune II video poker/slot; and the 709 video poker machines.

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